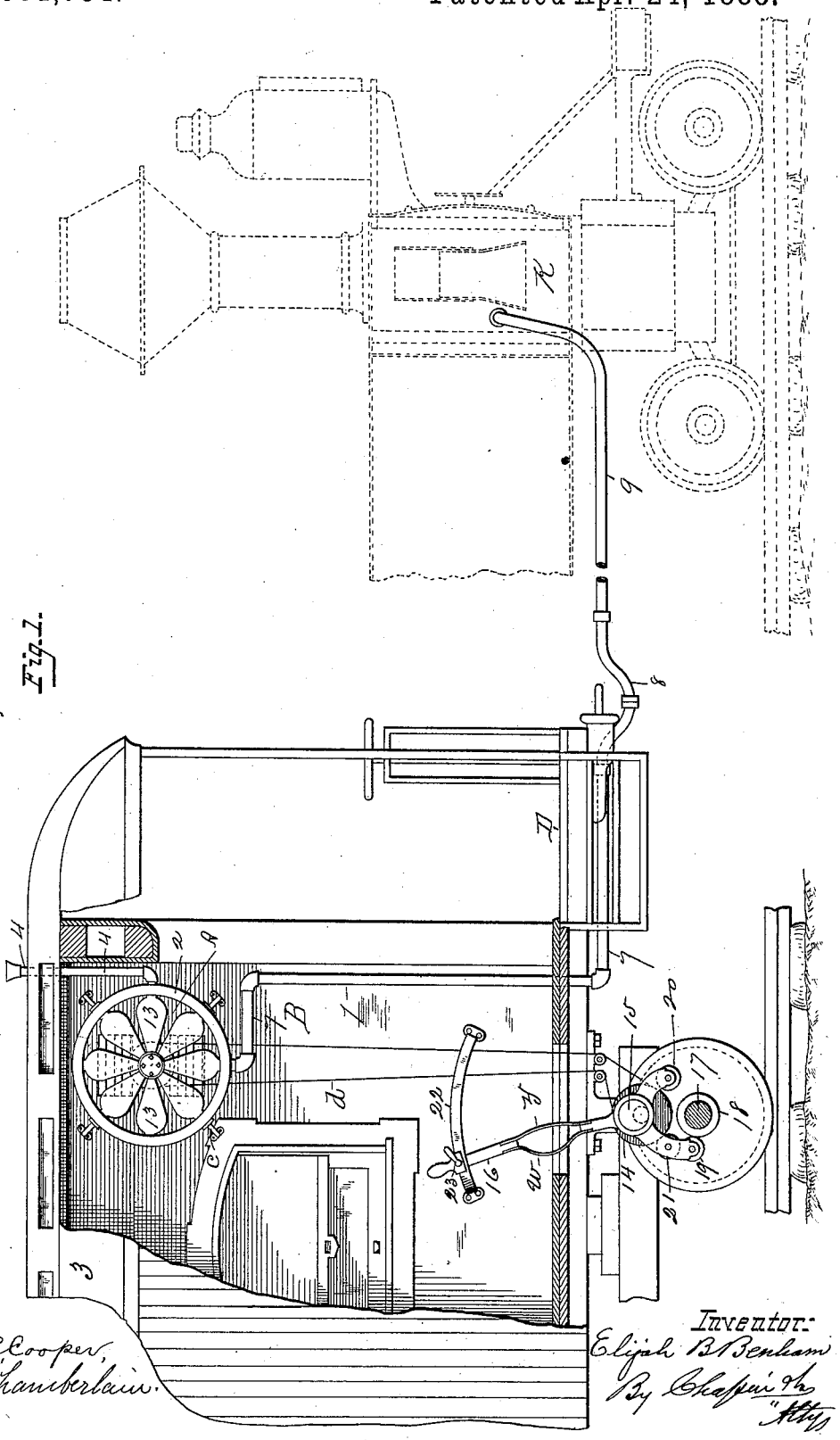
(No Model.) 2 Sheets—Sheet 1.

E. B. BENHAM.

MEANS FOR HEATING RAILWAY CARS.

No. 381,754. Patented Apr. 24, 1888.



Attest:
Court. A. Cooper,
G. M. Chamberlain.

Inventor:
Elijah B. Benham
By Chapin & Co
Attys

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Fig. 2.

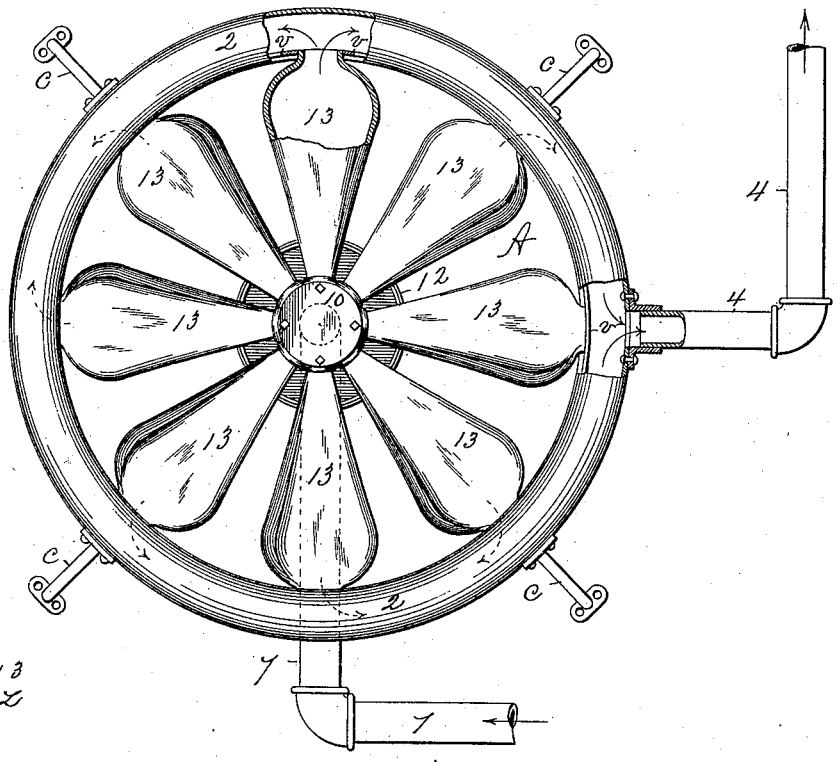


Fig. 6.

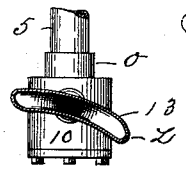


Fig. 3.

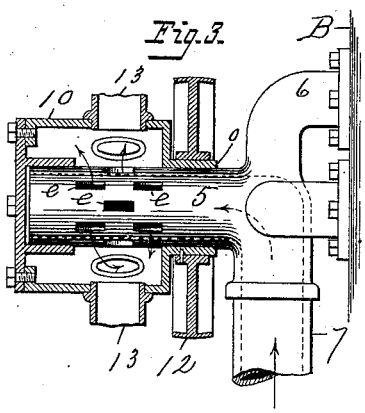


Fig. 5.

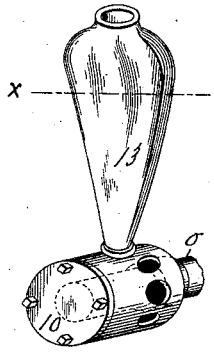
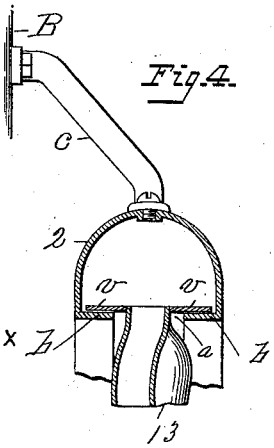


Fig. 4.



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UNITED STATES PATENT OFFICE.

ELIJAH B. BENHAM, OF HOLYOKE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO J. J. FRAZER, OF SAME PLACE.

MEANS FOR HEATING RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 381,754, dated April 24, 1888.

Application filed April 25, 1887. Serial No. 235,996. (No model.)

To all whom it may concern:

Be it known that I, ELIJAH B. BENHAM, a citizen of the United States, residing at Holyoke, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Means for Heating Railway-Cars, of which the following is a specification.

This invention relates to improved means for heating railway-cars, the object being to utilize the heat of the smoke-box or the products of combustion of the locomotive for heating the cars of a train; and the invention consists in the peculiar construction and arrangement of devices for conveying said heat to the cars and causing it to be radiated in the latter for warming purposes, all as hereinafter fully described, and pointed out in the claims.

In the drawings forming part of this specification, Figure 1 is a side elevation of a portion of a car, the side of the latter being shown broken away, said figure showing in dotted lines the outline of the forward part of a locomotive and a pipe connecting the smoke-box of the latter with said car, the latter having applied thereto devices for drawing the heated air from said smoke-box through said pipe into a car constructed according to my invention. Fig. 2 is a side elevation, partly in section, of a fan for drawing the heated air from said smoke-box, and a receptacle to receive the air from said fan, said figure showing portions of the pipe-connections of said fan and receptacle. Figs. 3, 4, 5, and 6 illustrate detail parts of said fan and air-receptacle, all of which are hereinafter fully described.

In the drawings, 2 indicates an air-receptacle to receive air from a fan, below described, consisting of a tubular ring, 2, whose form in cross-section is shown in Fig. 4, and the inner side thereof has formed therein the annular groove *a*. The inwardly-turned edges *b* of the tubular ring 2, (see Fig. 4,) on each side of said groove *a*, provide bearings on their inner sides for a continuous flat ring, *v*, which is fitted to bear on said edges lightly and cover said groove *a* to prevent the escape of air through the latter, and is capable of a rotary movement within the ring 2, carried by the arms 13 of the fan A, which engage therewith, as below described, a portion of one of said arms and a section of said flat ring being shown in Fig. 4. The said tubular ring 2 is secured against the side wall, B, of the inside of the car 3 by a series of braces, *c*, bolted to said ring and to said car-wall, whereby said ring is supported in a position somewhat removed from said wall. A discharge-pipe, 4, is secured to the periphery of the ring 2 and leads therefrom through the roof of the car, as shown in Fig. 1. Said ring is constructed of suitable cast or sheet metal.

A hollow hub, 5, of cylindrical form, having air-passages *e* through its sides, as shown in Fig. 3, of suitable metallic construction, is secured by an elbow-shaped arm, 6, to the wall B of the car, so that its axial line is central within the said ring 2, and a pipe, 7, communicates with the interior of said hollow hub, and from thence is carried downward through the floor of the car and extends under the platform D to the outer end of the latter, and has a suitable flexible coupling, 8, attached to the end thereof, which unites said pipe 7 with a pipe, 9, which communicates with the smoke-box K of the locomotive. The said hollow hub 5 constitutes the hub on which the arms 13 of said fan have a rotary motion, as hereinafter described, said arms being connected by one end to a cylindrical drum, 10, (see Figs. 3 and 5,) which is provided with suitable internal bearings for said hollow hub 5, as shown, and on a neck, *o*, on the drum 10 is fixed a driving-pulley, 12, whereby, by means as below described, a rotary motion is given to said drum and the arms of the fan. Said drum is provided with openings through its sides, in which are secured one end of the said hollow arms of the fan, and is of a diameter somewhat greater than that of said hub, in order to leave more or less air-space within that part of the drum surrounding the hub, as shown in Fig. 3. The said hollow arms 13 of the fan are made in the form shown in Figs. 2, 4, 5, and 6, and their outer ends extend through the aforesaid annular groove *a* in the tubular ring 2, and pass through and are attached to the said flat ring *v* in the ring 2, as clearly shown in Figs. 2 and 4. The said hollow arms 13 of the fan A have substantially the form in cross-section of the segment of a circle, as shown in Fig. 6, which illustrates a section of one of said hollow arms

on the line *x x*, Fig. 5. The said fan-arms are so fixed on the said drum 10 that the faces of the fan-arms are diagonal to the plane of rotation, as shown in Fig. 6, and thereby the concave sides of the arms are caused to strike the air as the fan rotates and cause it to be circulated in the car.

A pulley, 14, is hung on a suitable shaft under the floor of the car, and on an eccentric, 15, on the shaft on which said pulley 14 is hung, to rotate freely thereon, a lever, 16, is hung, as shown in Fig. 1, capable of a vibratory motion on said eccentric, the latter being held by the shaft on which it is fixed, in the position shown in said figure. The lower end of said lever 16, which is a starting-lever for the above-described fan, is of bifurcated form, as shown, each of the arms on its lower end extending opposite the sides of the axle 17, on which is a suitable pulley, 18, which is rigidly fixed thereon. Each of said arms on the lower end of said starting-lever has hung therein a pulley, 19 and 20, as shown, each of which is made to rotate by frictional contact with the pulley 18 on said axle. The arm of said lever, in which pulley 19 is hung, has an intermediate pulley, 21, hung on said arm, between the pulley 19 and said pulley 14, and said intermediate pulley has a frictional contact with the said pulley 14 and the pulley 19, whereby, when the starting-lever 16 stands in the position shown in Fig. 1, the pulley 14 is given a rotary motion, which motion is communicated to the drum 10 of the fan, the hollow arms 13 connected therewith, and the said flat ring *v*, with which the outer ends of said arms engage by means of a belt, *d*, connecting said pulley 14 and the pulley 12, which is fixed on the neck *o* of said drum, as above described.

Since it is desirable that the fan should always rotate in the same direction whichever way the car may be moving, the above-described connections are provided between the axle 17, from which the movement of the fan is derived, and the pulley 14, which drives the fan. Thus when said starting-lever is swung to the position shown in Fig. 1, or when it is swung in the opposite direction to bring the pulley 20 into engagement simultaneously with the pulley 18 on the axle and the pulley 14, the fan is rotated in the same direction because of the intermediate pulley, 21, between pulleys 19 and 14.

The starting-lever 16 is hung to vibrate on said eccentric 15, in order to give the proper motion to the short arm of said lever on which the pulley 20 is hung, whereby said pulley is brought to a proper frictional bearing between pulleys 18 and 14, as aforesaid, when said lever is swung to the right in Fig. 1.

The starting-lever 16 has its two ends united by two slightly-curved flat springs, *w* and *y*; or instead of said two springs a single one may be applied in substantially the same position, whereby when the upper end of said lever is secured to the curved locking-strap 22 by the usual handled bolt, 23, either one of the pulleys 19 or 20 is held yieldingly in contact with the pulley 18 and under such degree of spring-pressure as may be desirable to cause said fan to rotate with the car-axle. Fig. 1 shows the starting-lever in a position holding the pulley 19 against the axle-pulley 18, and consequently the spring *y* is drawn nearly straight, while the spring *w* is outwardly curved, proportionately to the pressure of said pulley 19 against the axle-pulley. When the direction of the movement of the car is reversed, the starting-lever is swung over and secured near the opposite end of the locking-strap 22, thereby causing the pulley 20 to be frictionally interposed between the pulleys 18 and 14 and the fan to be rotated in the same direction as before, and under these circumstances the said effect on the lever-springs *w* and *y* is reversed.

The operation of the above-described car-heating devices is as follows: It is well known to persons familiar with locomotive construction that the smoke-box K of the boiler is the receptacle directly of the intense heat from the fire which passes through the boiler-flues, and that said heat on reaching the smoke-box has fully performed its duty in generating steam and escapes through the smoke-stack into the air. The products of combustion which are drawn through the flues of the boiler into the smoke-box are charged with a great degree of heat—say 500° to 600° Fahrenheit—and to utilize said heat for warming the cars of a railroad-train and thus turn it to some profitable use is the object of the above-described devices.

The pipe 9, which connects with the interior of the smoke-box K, may serve to supply one or several cars, for in practice it may connect with a main pipe extending under or through the several cars of a train and a branch be run therefrom to the fan in each car, such as is illustrated by the upright portion of the pipe 7 in Fig. 1.

I have found that in practice a fan, made, as above described, with hollow arms communicating with an air-supply at its hub and with an air-receptacle and a delivery-pipe, as shown, is capable of drawing air and delivering it through said receptacle and ejecting-pipe, and consequently a fan so constructed is adopted for carrying out the purposes of this invention. Furthermore, while the locomotive is running, the rush of heated air through the boiler-flues into the smoke-box is so considerable that it becomes comparatively easy to divert a portion thereof and of the products of combustion through said pipe 9 for warming purposes, as aforesaid.

The train of cars being set in motion by the engine in the usual way, the fan A is started by the manipulation of the starting-lever 16, as described, and at once said products of combustion are drawn by the fan through the pipes 7 and 9 from the smoke-box K into the hollow arms of the fan, and the latter thereby become heated and constitute rapidly-rotating heat-radiators which warm the air of the car with which they come in contact, and the shape of

said arms, as above described, causes the air within the car to be rapidly blown away from and drawn between said arms, and within a short space of time the whole air of the car becomes heated nearly to the temperature of said products of combustion, which are rapidly drawn into and passed through the fan, and which being conducted through the ends of the hollow arms into the hollow ring 2, which also serves as a heat-radiator, and from said ring are conducted by the pipe 4 through the roof of the car.

It will be seen that the great heat contained in the matter drawn from the smoke-box, as described, is utilized in heating the fan and its described connected parts for radiating purposes without permitting any of the said products of the combustion of the fuel of the locomotive from escaping into the car.

For the purpose of producing the most advantageous heat-radiating effects in a car, and in order that it may be rotated with as little resistance as may be practicable, the arms of the fan A and the hollow ring 2 or air-receptacle are made, preferably, of sheet metal, iron being the most desirable.

It is obvious that the radiating-fan may be given a rotary motion by connection with the axle of the car by other than precisely the mechanism herein shown—as for instance, by a vertical shaft and gear-connections between the axle and said shaft and between the latter and the hub of the fan.

What I claim as my invention is—

1. Means for warming the cars of a train by the products of combustion taken from the smoke-box of the locomotive, consisting of a heat-radiating fan, substantially as described, having hollow arms supported in a position to rotate within a car, a belt, *d*, connecting-pulleys actuated by the axle of the car with the fan, whereby said fan is rotated, a pipe conveying the products of combustion from said smoke-box to the fan, a receptacle for said products of combustion, with which the hollow arms of the fan communicate, and an ejecting-pipe connected to said receptacle, combined and operating substantially as set forth.

2. Means for warming cars by the products of combustion taken from the locomotive, consisting of a heat-radiating fan having a series of hollow metallic arms, a drum to which said arms are fixed by one end, a circular tubular receptacle having an annular groove in its inner side, a flat ring within said receptacle and covering said groove through which said arms pass, a hollow hub on which said drum rotates, having communication therewith by passages through its sides, a pipe conveying said products of combustion from the smoke-box of said fan, and a discharge-pipe leading from said receptacle to the outside of the car, substantially as set forth.

3. Means in a car for receiving the products of combustion from the smoke-box of a locomotive and imparting the heat thereof to the air in said car, consisting of a heat-radiating fan constructed with a series of hollow metallic arms having in cross-section substantially the form of a segment of a circle, a drum to which said arms are fixed by one end, a tubular receptacle encircling the outer ends of said arms, having an annular groove in its inner side, a flat ring within said receptacle covering said groove through which said arms pass, a hollow hub on which said drum rotates having communication therewith by passages through its sides, and a pipe conveying the products of combustion from the smoke-box of a locomotive to said hollow hub and a pipe for discharging the products of combustion from said receptacle, substantially as set forth.

ELIJAH B. BENHAM.

Witnesses:
G. M. CHAMBERLAIN,
H. A. CHAPIN.